USER LOCALIZATION IN THE INTERNET OF THINGS SYSTEM

Dyuzhaev L. P., PhD., associate professor, Sharai A. V., Master student
Igor Sikorsky Kyiv Polytechnic Institute, Kyiv, Ukraine

Internet of Things technology for today is quite popular in the world and in Ukraine in particular. Internet of Things is a unified network of physical objects that are equipped with technology to communicate with each other and the environment.

One of the directions of this technology is the navigation of people indoors (such as shopping centers, airports, train stations, museums). Since the GPS in this case is available, beacon technology is widely used.

Beacons - are small sensors equipped with Bluetooth Low Energy technology (the BLE), which transmit a signal to the mobile device when approaching it at a certain distance (for example, within a radius of five meters) [1].

Beacons help guide navigators to their destinations. Types of navigational beacons include radar reflectors, radio beacons, sonic and visual signals. Visual beacons range from small, single-pile structures to large lighthouses or light stations and can be located on land or on water. Lighted beacons are called lights; unlighted beacons are called day beacons.

In contrast to the more expensive GPS, “Beacon” consume less energy. Also, the “Beacon” are designed to work in all weather conditions, without the need to connect to Wi-Fi. Beacon disadvantage is that the beacon transmission has a small radius, in addition to the walls, and even humans can interfere with the signal, reducing or completely inhibiting it. As well as the duplication of the signal.

A novelty on the market has so called DecaWave technology.

DecaWave's DW1000 is the world's first single chip UWB (Ultra WideBand) transceiver, enabling you to develop cost effective RTLS (Real Time Locating System) solutions with precise indoor and outdoor positioning to within 10 cm. Based on IEEE802.15.4-2011, the DW1000 is also aiming at Internet of Things applications thanks to up to 6.8 Mbps communication capability.

DecaWave ScenSor

ScenSor is a family of semiconductor radio communications products. First product DW1000 is a complete, single chip CMOS Ultra-Wideband IC based on the IEEE 802.15.4-2011 standard, which can enable tagged objects to be located both indoors and out to within 10 cm.

The resulting chip has a very wide range of applications for both Real Time Location Systems (RTLS) and Ultra Low Power Wireless Transceivers, including manufacturing, ePOS and retail, building automation, automotive, healthcare, lighting, security, transport, inventory, supply chain management and other industries.

Technology

DecaWave's DW1000 chip, is a complete single-chip CMOS Ultra-Wideband IC based on the IEEE802.15.4-2011 standard. DW1000 is the first in the DecaWave ScenSor family of parts, operates at data rates of 110 kbps, 850 kbps and 6.8 Mbps, and can locate tagged objects both indoors & outdoors to within 10 cm [2].

DecaWave has developed a genuinely disruptive IR-UWB technology, which addresses the next frontier of wireless technology: precise indoor location and communication. Not only that, it has done so in a standardized format, on a tiny chip, with small power consumption. This makes it functionally and economically viable to deploy – whether indoors, outdoors, in volume, or in remote or difficult-to-access locations.

Because DW1000 allows both accurate measurement of time and data communications to occur simultaneously it can be utilized for a wide variety of applications by developers of Real Time Location and Indoor Positioning Systems, Location based Services, Internet of Things and Wireless Sensor Networks.

The DW1000 IC provides a new approach to Real Time Location and Indoor Positioning Systems, Location Based Services, Wireless Sensor Networks and the Internet of Things by providing accurate location awareness and communication.

The Institute of Electrical and Electronics Engineers Standards Association (IEEE-SA) is a leading developer of global industry standards in a broad-range of industries, including: Power and Energy, Biomedical and Healthcare, Information Technology, Telecommunications, Transportation, Nanotechnology and Information Assurance.

IEEE802 refers to a family of IEEE standards dealing with local and metropolitan area networks including the IEEE802.11 standard with which most of us are familiar under its more common name Wi-Fi. The IEEE802.15.4 standard was designed to deal with relatively short range Wireless Personal Area Networks (WPAN) and includes the PHY and MAC specification for ZigBee devices.

Features:

– A single chip, IEEE802.15.4-2011 UWB compliant, Wireless Transceiver based on Ultra Wideband techniques;

– Allows the location of objects in Real Time Location Systems (RTLS) to a precision of 10cm indoors, even while moving at up to 5m/s;

– Allows high data rate communications, up to 6.8Mb/s, in Wireless Sensor Networks (WSN);

– Excellent communications range of up to 290m thanks to coherent receiver techniques;

– Short packet durations support high tag densities – up to 11,000 in a 20m radius;

– Highly immune to multipath fading – allows reliable communications in high fading environments;

– Low power consumption allows operation from batteries for long periods

depending on mode.

In addition to all that, DecaWave, have a number of key innovations in implementation of the IEEE802.15.4-2011 standard.

The first is in using a coherent receiver. This is a specific technique that, simply put, allows more energy to be extracted from the received signal than would be the case in a non-coherent implementation. This increases the operating range in non-line-of-sight conditions which is key to operation at a distance indoors where there are likely to be many obstacles and a line of sight between the transmitter and receiver most likely will not exist.

The second is proprietary to DecaWave and is the subject of patent applications. This allows us to implement the design in a significantly smaller silicon area than would otherwise be the case. Generally speaking, in semiconductor manufacture cost is proportional to die size so the smaller the die the lower the cost – and novel implementation allows ScenSor to be the smallest UWB IEEE802.15.4-2011 compliant chip on the market.

References

1. Что вам нужно знать о «биконах» [Электронный ресурс] — Режим доступа: https://simpozio.ru/2014/08/31/beacons. — Название с экрана.

2. DecaWave Technology [e-source] — Access mode: http://www.decawave.com/technology. — Title from screen.

Анотація

Представлено короткий огляд таких технології позиціонування людини в приміщенні як “beacon” та DecaWave. Розглянуто особливості технології DecaWave та можливості її застосування.

Ключові слова: інтернет речей, Beacon, DecaWave.

Аннотация

Представлены краткий обзор таких технологии позиционирования человека в помещении как “beacon” и DecaWave. Рассмотрены особенности технологии DecaWave и возможности ее применения.

Ключевые слова: интернет вещей, Beacon, DecaWave.

Abstract

A brief review of human positioning technology in the room as the “beacon” and DecaWave. The features DecaWave technology and possibilities of its application.

Keywords: Internet of Things, deacon, DecaWave.